10/20/17 "One finds limits by pushing them." -Herbert Simon

HW: "Quotient Rule HW" #5-8, 12

Test 3 on Monday 10/30

AIM: What is the Quotient Rule for Derivatives?

Warm Up:

2. The Quotient Rule:

If a function is the quotient of two differentiable functions then the derivative is “the **denominator times the derivative of the numerator minus the numerator times the derivative of the denominator, all divided by the denominator, squared.**

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]=\frac{g(x)f'(x)-f(x)g'(x)}{\left[g(x)\right]^2}$$

$$\frac{\text{Low di Hi - Hi di Low}}{\text{Low Low}}$$

EX #3: Find y' given $y = \dfrac{3x+7}{x^2-1}$ ← high ← low

$$y' = \frac{(x^2-1)(3) - (3x+7)(2x)}{(x^2-1)^2}$$

high $= 3x+7$

d high $= 3$

low $= x^2-1$

d low $= 2x$

$$y' = \frac{3x^2-3-6x^2-14x}{x^4-2x^2+1}$$

$$\boxed{y' = \frac{-3x^2-14x-3}{x^4-2x^2+1}}$$

EX #4: Differentiate and simplify.

$$g(x) = \frac{2x^3 + 4x^2 - 7}{x - 5}$$

$$g'(x) = \frac{(x-5)(6x^2+8x) - (2x^3+4x^2-7)(1)}{(x-5)^2}$$

EX #5: Find an equation of the tangent line to the graph of f at the point $(-5, 5)$

$$f(x) = \frac{x}{x+4}$$

$$f'(x) = \frac{(x+4)(1) - (x)(1)}{(x+4)^2}$$

$$f'(x) = \frac{4}{x^2 + 8x + 16}$$

$$= \frac{4}{(-5)^2 + 8(-5) + 16} = \frac{4}{1} \leftarrow \text{slope}$$

$$\boxed{y - 5 = 4(x+5)}$$

EX #6: Using the Constant Multiple Rule to Rewrite

Function	Rewrite	Differentiate	Simplify
$y=\frac{x^2-4x}{8}=\frac{x^2}{8}-\frac{4x}{8}$	$=\frac{1}{8}x^2-\frac{1}{2}x$	$\frac{1}{4}x-\frac{1}{2}$	$\frac{1}{4}x-\frac{1}{2}$
$y=\frac{3x^3}{5}$			
$y=\frac{6x^{\frac{5}{2}}}{x}$			
$y=\frac{6x^4+x^3-2x}{\sqrt{x}}$			

$$y'=\frac{8(2x-4)-\cancel{(x^2-4x)}(0)}{64}=\frac{16x-32}{64}$$